Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Innovations in the Broadcast Television Bands:	)	ET Docket No. 10-235
Allocations, Channel Sharing and	)	
Improvements to VHF	)	

COMMENTS AND PETITION FOR RULEMAKING OF CAPITOL BROADCASTING COMPANY

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Summary

Point-to-multipoint *broadcasting* is essential for the delivery of bandwidth-intensive video, public safety information, and news and entertainment to 21st century consumers. Wireless carriers, both in the United States and the world over, acknowledge this indisputable fact. Therefore, it is premature to reallocate television broadcast spectrum for point-to-point communications or to otherwise impair the ability of broadcast television licensees to innovate to meet the nation's bandwidth needs.

The National Broadband Plan ("*Plan*") itself acknowledges that a reallocation of existing television broadcast spectrum is not necessary to achieve the *Plan*'s basic broadband goals. Indeed, the *Plan* notes that its chief goal of universal broadband access has virtually been achieved, already, with fixed broadband services. Substantial swaths of underutilized spectrum are currently available for wireless broadband. And expected increases in spectral efficiency will provide throughputs capable of handling most predictions of future demand. Significantly, the American Recovery and Reinvestment Act of 2009, the underlying statutory basis for the *Plan*, nowhere mentions *wireless* broadband, mobile video, or a reallocation of television broadcast spectrum. Congress has *not* directed the Commission to reallocate television broadcast spectrum to facilitate wireless broadband's delivery of mobile video.

The *Plan*, nevertheless, sets an aspirational goal for delivery of all types of data to everyone, everywhere, at any time, of which the most bandwidth-intensive data, by far, is video programming. However, there is not enough spectrum, nor enough cell towers, now, nor will there be in the future, to enable every American to view high-definition video programming anytime and anywhere on a point-to-point transmission basis over wireless networks as envisioned by the *Plan*.

The wireless carriers admit as much. Even today, as the *Plan* acknowledges, a

substantial portion of non-linear, non-traditional video is pushed to Wi-Fi networks rather than to the wireless carriers' own networks. Significantly, Tony Melone, Chief Technology Officer of Verizon Wireless, has publicly stated that Verizon Wireless is seeking "to develop the technology to incorporate a *broadcast capability* [into its 4G/LTE (Long-Term Evolution) service]."[1]

Accordingly, the solution to mobile video demands is not to reinvent the wheel by taking spectrum already allocated for broadcasting and assign it to wireless providers who, themselves, will develop "a broadcast capability" for mobile video. The solution is to allow existing television broadcasters to use broadcasting's inherently more efficient delivery mechanism and work in partnership with wireless broadband providers to enable seamless delivery of high-volume, bandwidth-intensive video content to consumers on an on-demand basis.

Wireless broadband cannot now—nor will it even if the *Plan* is implemented—deliver on-demand video content to all potential viewers on a *point-to-point* basis. For example, more than 11,500 4G transmitters and cell towers are required to provide coverage to all of the Raleigh-Durham television market's population on a simultaneous basis. In contrast, Capitol's Raleigh television station, WRAL-TV, provides a primary service quality digital service to nearly 3 million people with but *one* transmitter and *one* (existing) tower. It is unrealistic to expect that hundreds of thousands or even millions of additional cell towers can or ever will be constructed nationwide to deliver the bandwidth-intensive video services now provided by the nation's local television stations. Local governmental zoning authorities and environmental

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[1] Stephen Lawson, "Verizon Wireless Expects to Use Broadcasting to Deliver Live Video over Its Upcoming LTE Network," PCWorld (Nov. 8, 2010), *available at* <http://www.pcworld.com/businesscenter/article/210063/verizon_looks_to_video_broadcasting_on_lte.html> (emphasis added).

groups across the country will not allow it—and should not allow it, given the more spectrally efficient and environmentally friendly point-to-multipoint broadcast platform option. For that reason alone, the *Plan* is destined to fail.

But even if the bandwidth and environmental obstacles could be overcome (which they cannot), putting greater spectrum resources in the hands of the wireless industry—dominated by only *four* companies—will expand exponentially the "gatekeeping" market power of these entities. Can any regulatory structure safeguard a citizenry whose principal means of interconnectivity to public safety, news, information, and entertainment video content may soon be controlled by just four corporate entities? The world recently witnessed the ability of the Mubarak regime to totally shut down Internet connectivity throughout Egypt because control of the telecommunications system was essentially vested in two entities. The even greater aggregation of control that will accrue to large entities purchasing even larger blocks of spectrum is fundamentally inconsistent with democratic principles.

The *Plan* goes further, proposing a "repacking" of television spectrum in which wireless companies will be permitted to operate with the most desirable "beach front" spectrum while broadcasters will be relegated to the less desirable "landfill" spectrum of the VHF frequencies which are cluttered with man-made noise—the detritus of the airwaves. The Commission has already obtained substantial evidence that its attempts in the *Notice* to rehabilitate the VHF spectrum, particularly the low VHF band, cannot and will not succeed as a scientific and engineering matter.

But even if the transmission characteristics of the VHF band could be enhanced, the fact remains that the *Plan* cannot succeed without a broadcast component. The Commission should allow market forces to drive the convergent evolution of a broadcast and wireless broadband

technology, rather than selecting an industry with no broadcast experience to develop a broadcast component.

Digital television broadcasting, as currently constituted, utilizes modulation and compression techniques developed during the dawn of the digital era. But there is no law of physics, law of economics, or law of Congress that requires television broadcasting to forever use late 20th century technology. To the contrary, even today, broadcasters are laying the groundwork for new modulation, compression, and transmission schemes—the next phase of broadcast technology evolution—with techniques that show great promise and that will serve to mitigate, if not avert altogether, any future spectrum or bandwidth scarcity crisis.

In the meantime, mobile DTV already has the capability to accommodate a substantial portion of mobile video demand requirements in a spectrally efficient manner. Wireless carriers and broadcasters can work together *now* to leverage the benefits of existing broadcast technologies to deliver video content in concert with wireless broadband services. Just as wireless carriers already seek to offload as much content to Wi-Fi networks as feasible (and are exploring greater offloading opportunities to femtocells), so, too, can high demand video content be offloaded to broadcasters. It would be foolhardy for wireless carriers to congest broadband bandwidth with millions of *point-to-point* two-way unicast sessions when the most popular video content—primarily broadcast television content—can be delivered far more efficiently to mobile devices by reliance on *point-to-multipoint* television broadcasting.

If a spectrum or bandwidth scarcity crisis should be proven to exist, the existing ATSC 8-VSB scheme could be replaced with a new modulation, coding, and transmission scheme, of which various varieties are currently being developed around the world. One possibility is that a new broadcasting standard could be based on Orthogonal Frequency Division Multiplexing

("OFDM") (rather than 8-VSB), the same system used by LTE.

Under this standard, television broadcasters would be able to partner with wireless carriers to seamlessly deliver mobile video content in the most spectrally efficient manner possible. A broadcast evolution of this kind will enable collaborative systems to shift content "on the fly" between broadcast and wireless broadband/unicast delivery. Consumers would experience an "anytime, anywhere" video service as contemplated by the *Plan*, without a spectrum or bandwidth scarcity crisis and without the *Plan*'s insurmountable and insufficient bandwidth and harmful environmental and other policy consequences.

Capitol respectfully requests that the Commission initiate a rulemaking proceeding to consider these issues. Capitol proposes a timeline for action on the development of a broadband/broadcasting convergent evolution solution. The following are examples of the benefits of proceeding to a broadband/broadcasting convergence:

* It would alleviate any potential spectrum or bandwidth scarcity crisis for now and the long-term.

* It would provide maximum spectral efficiency within the broadcast television spectrum bands.

* It would create a *complementary* broadband/broadcasting architecture, rather than a duplicative wireless broadband broadcasting capability.

* It would address mobile video demands and utilize the most established and efficient technology—broadcasting—to solve the mobile video problem.

* It would create opportunities for innovation by local television broadcasters, and, to the extent stations partner with wireless broadband providers, it would provide an ongoing revenue stream to the government through the current 5% ancillary/supplementary services fee.

* It would achieve all these goals and, if necessary, meet the *Plan*'s 10-year target of repurposing 500 MHz of spectrum for wireless broadband services.

In contrast, if government policy fails to promote cooperation between broadcasters and wireless carriers, then the nation will likely see further calls for additional spectrum reallocations and auctions within the next 10-15 years, if not sooner.

For the foregoing reasons, Capitol respectfully requests that the Commission refrain from adopting the various proposals contained in the *Notice* and proceed, instead, to initiate rulemaking proceedings focused on a broadband broadcasting convergence to meet the communications needs of 21st century America.

Capitol looks forward to working with the Commission, Members of Congress, and the wireless industry to develop the most spectrally efficient and environmentally friendly approach that can address the mobile video needs of the American people on a sustainable, long-term basis.

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COMMENTS AND PETITION FOR RULEMAKING OF
CAPITOL BROADCASTING COMPANY

Capitol Broadcasting Company ("Capitol")[1] submits these comments in response to the *Notice of Proposed Rulemaking* ("*Notice*") issued in the above-referenced proceeding.

The *Notice* seeks comment on the Commission's proposals to add new allocations on a co-primary basis for fixed and mobile wireless services in the existing television frequency bands, to establish "channel sharing" by multiple television licensees on one 6 MHz television channel, and to attempt to increase the utility of the VHF bands for television broadcasting. As shown below, point-to-multipoint *broadcasting* is fundamental to the delivery of bandwidth-intensive video to 21st century consumers. Therefore, it is premature to begin the process of reallocating broadcast spectrum or to constrain or impair the ability of television licensees to innovate to meet the nation's bandwidth needs. Consequently, the Commission

[1] Capitol owns and operates four full-power television stations and one low-power television station serving various communities in North Carolina and South Carolina. Capitol has long been a leader in integrating new technologies in broadcasting. For example, Capitol's station, WRAL-TV, Raleigh, North Carolina, was granted the nation's first experimental authorization to broadcast a digital television signal in 1996 and became the first commercial television station to broadcast an HDTV signal. WRAL-TV was also the first station to offer free, over-the-air broadcasting to mobile devices, commencing service to television screens installed in Raleigh city buses in June 2009. In addition, Capitol has been an early innovator in streaming its stations' local news broadcasts over the Internet.

should not adopt its proposals at this time. Instead, Capitol urges that a comprehensive inventory of all available spectrum be conducted to determine if a scarcity of bandwidth, in fact, exists. Capitol also respectfully petitions the Commission, pursuant to 47 C.F.R. § 1.401, to initiate a rulemaking to evolve the digital television broadcasting standard to facilitate collaboration between television broadcasters and wireless broadband providers.

I. The Underlying Factual and Legal Bases of the National Broadband Plan and the *Notice* Do Not Support the Reallocation of Television Broadcast Spectrum

The *Notice* asserts that its proposals are "consistent with the goal set forth in the National Broadband Plan (the '*Plan*') to repurpose up to 120 megahertz from the broadcast television bands for new wireless broadband uses."[2] That goal, however, was never adopted by the Commission, and it is, ultimately, fundamentally inconsistent with the very premises of the *Plan*.[3]

The *Plan* was developed by Commission staff—*not the Commission*—pursuant to Section 6001(k) of the American Recovery and Reinvestment Act of 2009 (the "Recovery Act").[4] The *Plan*'s recommendation to reallocate and repurpose 120 MHz of television broadcast spectrum is inconsistent with the *Plan*'s stated goals and factual predicate. The *Plan* sets as its main goal the availability and adoption of broadband services to 100% of Americans,

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[2] *Notice* at ¶ 1.

[3] The FCC staff drafted *Connecting America: The National Broadband Plan* and released it in March 2010. However, the Commission never voted to adopt the *Plan*.

[4] *See* American Recovery and Reinvestment Act of 2009, § 6001(k), PUB. L. NO. 111-5, 123 Stat. 115, 515-16 (2009).

either through fixed or wireless means, at actual download speeds of 4 Mbps by 2020.[5] But, according to the *Plan*, even a year ago 95% of the nation's population already had access to *fixed* broadband services capable of supporting download speeds of at least 4 Mbps,[6] and, by 2013, without *any additional spectrum* allocated to wireless broadband, more than 90% of the population is predicted to have access to 4G wireless broadband services with speeds ranging from 2 Mbps to 10 Mbps.[7] In other words, the nation is already very close to the *Plan*'s stated goal with the existing allocated spectrum and without *any* reallocation of spectrum, let alone 40% of the television broadcast spectrum.

Moreover, according to the *Plan*, 547 MHz of spectrum is currently licensed as flexible use spectrum that may be used for mobile broadband. Of this amount, 170 MHz is used by the Cellular and PCS bands, but the majority of the remaining 377 MHz was only auctioned or rebanded recently and "is just coming online for mobile broadband deployment."[8] So, *more than two-third*s of available mobile broadband spectrum is not yet fully utilized. In addition, the *Plan* observes that "spectral efficiency of wireless technologies has increased by a factor of roughly 40 or more since the early days of second-generation (2G) wireless."[9] The *Plan* also cites the United Kingdom's Ofcom, that nation's communications regulator, as stating that "improvements in spectral efficiency and the move to higher density network architectures will

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[5] *See Plan* at 135.

[6] *See Plan* at 20.

[7] *See Plan* at 22.

[8] *Plan* at 84.

[9] *Plan* at 41.

provide sufficient capacity to handle most high-end predictions of future demand."[10] Based on underutilized spectrum and technological improvements in spectral efficiency, the *Plan*'s own factual basis calls into question the speculation of an imminent spectrum scarcity crisis.

In sum, according to the *Plan* itself, its chief goal of universal broadband access has virtually been achieved already with fixed broadband services. There are substantial swaths of underutilized spectrum currently available for wireless broadband. And spectral efficiency will provide throughputs capable of handling most predictions of future demand. Significantly, the Recovery Act nowhere mentions *wireless* broadband, mobile video, or reallocation of television broadcast spectrum. Thus, Congress did *not* direct the Commission to reallocate television broadcast spectrum to facilitate wireless broadband's delivery of mobile video. Thus, the obvious questions: Why is the *Plan* focused on reallocating 120 MHz of television broadcast spectrum? Why has the instant *Notice* been issued?

The answers must lie in an assumption that the delivery of high bandwidth video to handheld and mobile devices will require *even more* spectrum. For example, the *Plan* observes that, "[e]xcept for high-definition video, most applications in use today can be supported by actual download speeds of about 1 Mbps."[11] But the *Plan* also states: "A user who values little more than email and browsing news sites has, in principle, many choices—nearly any broadband access technology will do. But a user who streams high-definition video and enjoys gaming probably requires high download and upload speeds and low latency. That user will likely have

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[10] *Plan* at 84.

[11] *Plan* at 16.

few choices."[12] However, according to economists, "The social benefits of the high-definition television delivered over the Internet are presumably entirely private, and, as such, do not, as a matter of standard economic theory, warrant government intervention."[13] The Commission has yet to address why the *Plan* would have the government interfere in the marketplace to confer *private* social benefits rather than *public* social benefits.

Perhaps more importantly, a recent Cisco Systems study estimates that, by 2014, 66% of all mobile traffic will be video.[14] And, according to the *Plan*, "[u]ser-generated video and entertainment—from sites such as YouTube and Hulu—are a large portion of the total video traffic over broadband connections."[15] Nevertheless, "[t]raditional, or 'linear,' television still accounts for more than 90% of all time spent watching video."[16] Moreover, of the top 100 television programs of the 2009-2010 television season, 98 were broadcast television shows.[17]

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[12] *Plan* at 41.

[13] T. Randolph Beard, George S. Ford, and Lawrence J. Spiwak, *The Broadband Adoption Index: Improving Measurements and Comparisons of Broadband Deployment and Adoption*, Phoenix Center for Advanced Legal and Economic Public Policy Studies (July 2009), at 12 n.19, *available at* <http://www.phoenix-center.org/pcpp/PCPP36Final.pdf>.

[14] *See Cisco Visual Networking Index Forecast Predicts Continued Mobile Data Traffic Surge* (Feb. 9, 2010), *available at* <http://newsroom.cisco.com/dlls/2010/prod_020910b.html>. Interestingly, the 2011 update of this report estimates that 66% of all mobile traffic will be video in 2015—the same percentage as in 2014. *See Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2010–2015* (Feb. 1, 2011), at 9, *available at* <http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html>.

[15] *Plan* at 17.

[16] *Plan* at 17.

[17] *See* Television Bureau of Advertising, *TV Basics* (updated Feb. 2011), at 11, *available at* <http://www.tvb.org/media/file/TV_Basics.pdf>. According to the TVB study, 302 of the 312 top television programs were broadcast television programs.

This is the rub. Most applications do not require high-speed wireless broadband throughput. Most video remains linear television. But mobile video is growing geometrically and many consumers want to see what they want to see anytime, anywhere, on any device.

The *Plan*, and now the *Notice*, assumes that the way to address this projected consumer demand is to take spectrum from television broadcasters and sell it to wireless carriers with the sale proceeds to be shared with broadcasters in some yet-unknown manner. But that is not only an approach with adverse public policy ramifications, but also an approach that simply does not and cannot work from an engineering perspective. There is simply not enough spectrum, nor enough cell towers, available now, nor will enough ever be available, to enable every American to view high-definition video programming anytime and anywhere over wireless networks as envisioned by the *Plan*.

The wireless carriers know this. Even today, as the *Plan* itself acknowledges, a substantial portion of non-linear, non-traditional video is pushed to Wi-Fi networks rather than wireless carriers' own networks.[18] And more significantly, Tony Melone, the Chief Technology Officer of Verizon Wireless, has publicly stated that Verizon Wireless is seeking "to develop the technology to incorporate a *broadcast capability* [into its 4G/LTE (Long-Term Evolution)

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[18] *See Plan* at 77 (reporting that, according to a November 2008 report, 42% of iPhone traffic was transported over Wi-Fi networks). According to a February 2011 report, 20% of all data traffic is offloaded to Wi-Fi networks today, and that percentage is as high as 80% in Hong Kong. *See* Lynnette Luna, *Wi-Fi Offload for Mobile Networks: 20% of Traffic and Counting*, FIERCE BROADBAND WIRELESS (Feb. 25, 2011), *available at* <http://www.fiercebroadbandwireless.com/special-reports/wi-fi-offload-mobile-networks-20-traffic-and-counting>. According to an August 2010 report, offloading is projected to increase to 48% of all data traffic by 2015, which, because the volume of traffic will itself have increased, represents a 100-fold increase in offloading. *See* ABIrearch, *Mobile Data Offloaded Will Grow 100-fold by 2015, Says ABI Research* (Aug. 16, 2010), *available at* <http://www.abiresearch.com/press/3479-Mobile+Data+Offloaded+Will+Grow+100-fold+by+2015%252C+Says+ABI+Research>.

service] . . . . We think that will be a solution to this problem down the road, that there will be a broadcast element to our 4G network that can then more efficiently deal with the live content."[19]

The solution to the mobile video issue is not to reinvent the wheel by taking spectrum already allocated for broadcasting and assign it to wireless providers who will develop "a broadcast capability." The solution is to allow existing television broadcasters to use broadcasting's inherently more efficient delivery mechanism and work with wireless broadband providers to enable seamless delivery of content to consumers on an on-demand basis.

II. The Reallocation of Television Broadcast Spectrum Is Premature

In addition to the fact that the underlying factual and legal bases of the *Plan* do not support the reallocation of television broadcast spectrum, the *Plan* and its initial implementation proposed in the *Notice* suffer from numerous other shortcomings that plainly render reallocation of television spectrum premature at this time.

* The *Plan* makes recommendations, which the *Notice* proposes to implement, before a complete spectrum inventory audit has been undertaken. This approach fails to identify and then take advantage of fallow spectrum. In other words, the *Plan* takes a "shoot first, aim later" approach to spectrum management—hardly a responsible way of managing the nation's valuable spectrum resources.

* The *Plan* appears to be based on an assumption of a spectrum crisis that does not, in fact, exist. After the *Plan* was released, Ivan Seidenburg, CEO of Verizon, stated: "I don't

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[19] Stephen Lawson, "Verizon Wireless Expects to Use Broadcasting to Deliver Live Video over Its Upcoming LTE Network," PCWorld (Nov. 8, 2010), *available at* <http://www.pcworld.com/businesscenter/article/210063/verizon_looks_to_video_broadcasting_on_lte.html> (emphasis added).

think we'll have a spectrum shortage the way this document suggests we will."[20] Moreover, the wireless carriers are not doing anything in their other business operations to indicate there is a crisis. What they and certain other interests have done is lobby the government to change the ground rules—as illustrated by the *Notice*—to gain a competitive advantage to secure more spectrum for themselves in the future. If there were a spectrum crisis, these companies, obviously, would be scrambling to develop creative ways to resolve it, including immediate collaboration with broadcasters who, plainly, are in a position to alleviate it.

* If there is no spectrum crisis, or even if the shortage will manifest itself many years from now, then the *Plan*'s approach—and that of the *Notice*, which lays the groundwork for further implementation of the *Plan*—means that the government will likely fail to recognize the full value of the spectrum by selling too early and at artificially low prices. Full value for the American public cannot be obtained if the spectrum is sold into a market where the alleged crisis is artificial, not real, and other spectrum is underutilized or lying fallow.

* Although the *Plan* derives from the economic stimulus intended by the Recovery Act, this approach does not appear to contemplate international harmonization and trade and technological development patterns. The early adoption of CDMA by some wireless carriers in the United States has hindered competition and technological development in comparison with other countries, such as Japan, South Korea, and Western European states. Ignoring international harmonization and trade issues could prevent the United States from regaining the lead in broadband deployment and technological innovation. At the same time, by constraining

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[20] John Eggerton, *Verizon CEO Does Not Back FCC Spectrum-Reclamation Proposal; Seidenberg: Let the Market Rule, FCC Shouldn't "Tinker" with Process*, MULTICHANNEL NEWS (Apr. 8, 2010).

the television broadcast industry, which employs hundreds of thousands of Americans, jobs will ultimately be lost and broadcast engineering development will be stifled. In contrast, implementing policies that encourage international harmonization could also raise the value of the spectrum and drive more revenue in any incentive auctions.[21]

* If "successful" as currently envisioned, the *Plan*'s and *Notice*'s schemes will ultimately result in fewer television broadcast outlets. Local broadcast television, however, remains the primary medium by which Americans get their news. According to the Pew Research Center, 78% of Americans say they get their news from a *local television station*, more than any other medium.[22] Reducing the number of broadcast outlets will have the unintended effect of reducing the plurality of voices and the number of journalistic outlets, at the same time that traditional print journalism is in deep economic decline. Indeed, the Commission is already deeply concerned with "whether all Americans have access to vibrant, diverse sources of news and information" and "the state of the traditional sources of news and reporting."[23] The negative implications of weakening the ability of broadcasters to ensure "the widest possible dissemination of information from diverse and antagonistic sources," *Associated Press v. United*

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[21] *Cf*. Joan Marsh, AT&T Public Policy Blog, *Unlocking the Potential of AWS-3 Spectrum* (Sept. 2, 2010), *available at* <http://attpublicpolicy.com/government-policy/unlocking-the-potential-of-aws-3-spectrum/> (stating that international harmonization "lowers equipment costs and facilitates international roaming. International harmonization is a goal that is becoming more and more important as more bands are becoming fragmented around the globe.").

[22] *See Understanding the Participatory News Consumer*, Pew Research Center's Project for Excellence in Journalism (Mar. 1, 2010), *available at* <http://www.journalism.org/node/19537>.

[23] *FCC Launches Examination of the Future of Media and Information Needs of Communities in a Digital Age*, Public Notice, 25 FCC Rcd 384, 384, 386 (2010).

States, 326 U.S. 1, 20 (1945), are manifest.

* The proposed approach will essentially negate decades of broadcast innovation and strand billions of dollars of investment by the broadcast industry, including the many billions just spent by local broadcast stations on the DTV transition. This could have a substantial negative effect on investment in communications infrastructure beyond television broadcasting, since the government will be sending a message to investors that if their industry falls out of favor with the government they may be unable to achieve a return on their investments. Why invest in innovation if, before the investment can be monetized, the government may simply decree it is time to abandon it and move on to the next thing?

* Finally, if the delivery of mobile video requires a broadcasting component, as Capitol and as the wireless industry itself contend, reallocation of television broadcast spectrum not only fails to leverage established broadcast infrastructure to help address mobile video demand, but it will have the perverse effect of confiscating spectrum already allocated to its highest and best use and devaluing it (regardless of what may be paid for it at auction) by reallocating it to a service that will be unable to achieve the same efficiencies.

These negative repercussions will be avoided if broadcasting is allowed to be a part of the solution.

III. Wireless Broadband Cannot Scale to Deliver On-Demand Video Content to All Potential Viewers, and, Even If It Could, the Environmental Impact Would Be Severe

Mobile networks work on the point-to-point, or one-to-one, delivery model. Assuming there is no voice or other data usage on the network, a typical 4G transmitter can accommodate

only 240 *simultaneous* users.[24] In a market such as Raleigh-Durham, Capitol's home market and the 25th largest DMA in the country, there are nearly 2.8 million people. It would take more than 11,500 4G transmitters and cell towers to provide coverage to the market's population on a simultaneous basis. Of course, not everyone would be downloading bandwidth intensive video content at the same time, but large television events such as the Super Bowl and Academy Awards can attract 40% of the populace, and many of those not attracted to the main event are watching other video at that time. Assuming just half of the population is watching video at one time, it would still take nearly 6000 4G transmitters and cell towers to provide service on a simultaneous basis. Obviously, there are not 6000 mobile transmitters in the Raleigh-Durham market nor will there ever be. Nor can 6000 cell towers realistically be expected to be constructed in light of local zoning and environmental considerations. Local governments and environmental groups throughout the country would never approve them—even if they could be justified on a cost basis.

The graphic on the following page illustrates the practical and environmental folly of replacing one existing broadcast tower with thousands of cell towers in the Raleigh-Durham market.[25] The equation becomes even more severe when extrapolated throughout the nation.

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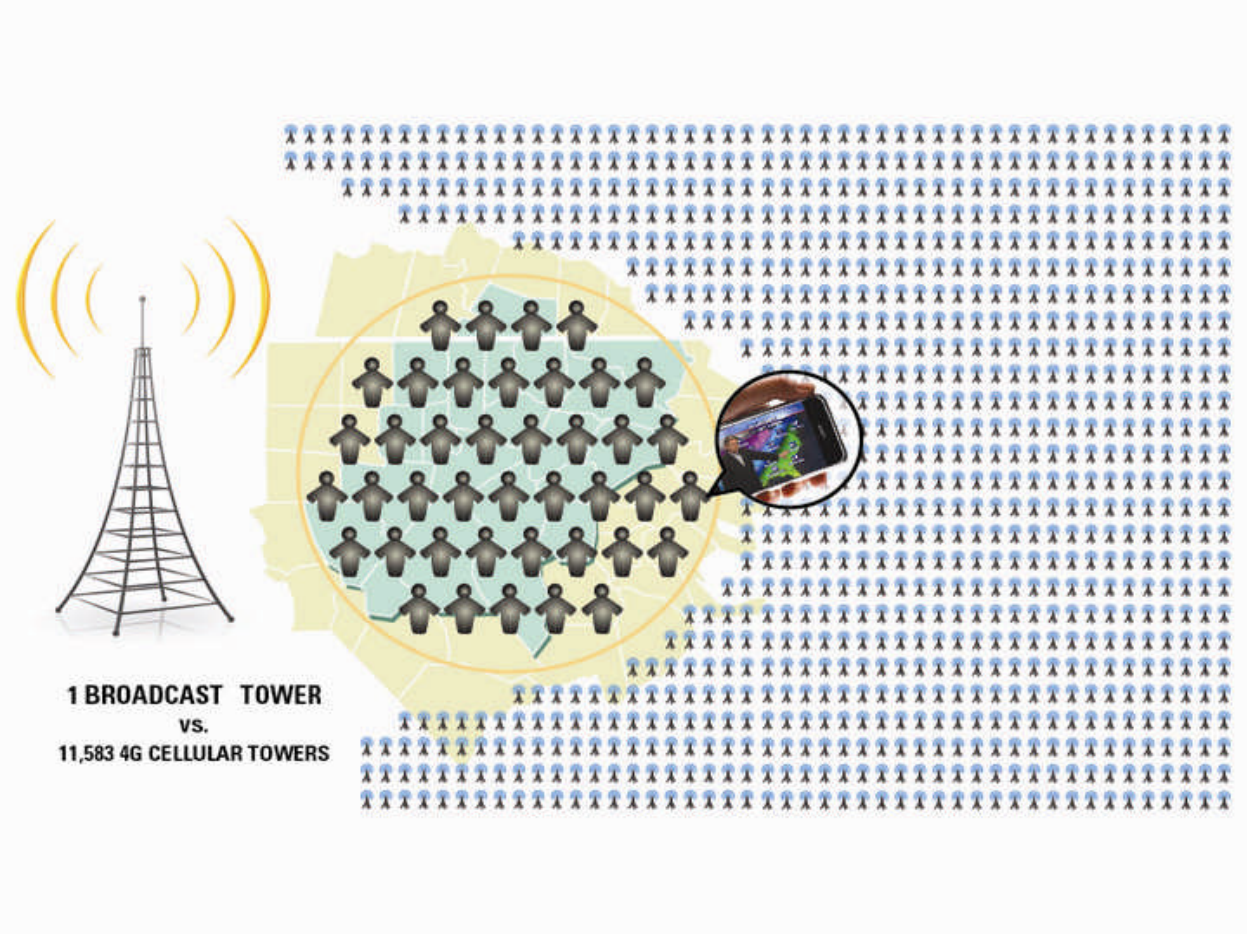
[24] The figure in the text assumes a configuration of 30 Mbps per 4G transmitter using 3 sectors and a 384 Kbps video bit rate. Throughput is based on Michael Souryal, *Analysis of LTE for AMI Headend/DAP Interface*, National Institute of Standards and Technology, U.S. Department of Commerce (Sept. 3, 2010), *available at* <http://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/PAP02Wireless/LTE_SmartGrid_Analysis.ppt>.

[25] The illustration obviously cannot depict 11,500 cell towers on a single page so each cell tower symbol represents approximately 15 individual cell towers.

Raleigh-Durham Market Cell Tower to Broadcast Tower Ratio
11,583 : 1



It should be apparent that wireless broadband is not, in the real world, a viable solution for the mobile video driver of broadband policy. Even if there were enough spectrum itself—which there is not—it would be impossible to construct throughout the nation all of the cell towers necessary to deliver the content the *Plan* assumes consumers will demand.[26] Aside from the wasteful cost, the construction of the hundreds of thousands, if not millions, of the additional

[26] Even if there were enough tower sites, the power management, frequency reuse, and interference patterns would be virtually impossible to manage. In this regard it is worth noting that the NIST LTE Smart Grid analysis intentionally ignores inter-sector interference issues.

cell towers required would create an environmental and regulatory nightmare.

Thus, it is understandable that, as noted above, wireless carriers, themselves, are seeking to develop a broadcast capability. Broadcasting, which utilizes a point-to-multipoint, or one-to-many, delivery model, is the most efficient means yet devised to deliver content to large numbers of people at the same time. In contrast with the 6000 transmitters and cell towers needed to provide coverage of the Raleigh-Durham market, Capitol's station, WRAL-TV, Raleigh, North Carolina, provides a primary service (noise-limited) quality digital signal to nearly 3 million people with *one* transmitter and *one* (existing) tower.

Broadcasting, plainly, is both environmentally "greener" and more spectrally efficient than wireless mobile. There are and will continue to be far fewer television broadcast towers than cell towers required to deliver high-volume, bandwidth-intensive video, and, for the most part, they have all already been built. The construction of innumerable additional cell towers throughout the nation will have a negative impact on the environment of monumental proportions. Television broadcasting uses only 294 MHz of spectrum to reach virtually every American.[27] By contrast, the *Plan* is seeking 500 MHz of additional spectrum to be combined with the 547 MHz of existing spectrum for wireless broadband deployment. Yet even this 1+ GHz of spectrum will never be capable of delivering on-demand mobile video to all potential users *without a broadcast component*.

In short, the *Plan* is destined to fail both in terms of spectral efficiency and adverse environmental impact if the Commission adopts the proposals set forth in the *Notice*.

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[27] *See, e.g.*, Reply Comments of National Association of Broadcasters, MB Docket No. 10-238 (filed Feb. 22, 2011), at 2 (stating that 99.24% of the total U.S. population has access to at least one in-state television station on an over-the-air basis).

IV. The Reallocation of Television Broadcast Spectrum Will Have Negative Public Policy Repercussions

If the Commission obtained statutory authority to auction reallocated television broadcast spectrum for mobile services, not only would the use of this spectrum for the delivery of mobile video be ineffectual in achieving the *Plan*'s implicit goal, as demonstrated above, but it also raises a host of public policy issues with negative consequences for the nation and its communications infrastructure.

Already today just four companies—Verizon, AT&T, Sprint, and T-Mobile—control 91% of all mobile connectivity in the United States.[28] These four companies have a Herfindahl-Hirschman Index of 2427.[29] Even small gains in market share by these entities will result in the market being deemed highly concentrated under the Department of Justice and Federal Trade Commission's new Horizontal Merger Guidelines.[30] It should be apparent that these four companies are likely purchasers of any auctioned reallocated television broadcast spectrum. Shifting even more spectrum resources into the hands of these four companies would further reduce competition, a worrisome trend already in evidence in many European countries with spectrum auctions.[31]

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[28] *See* Chetan Sharma Consulting, *US Mobile Data Market Update Q4 2010 and 2010 Powerpoint* (Feb. 2011), at Slide 15, *available at* <http://www.chetansharma.com/usmarketupdate2010.htm> (stating the U.S. market carrier subscriber share as follows: Verizon, 33%; AT&T, 31%; Sprint, 16%; T-Mobile, 11%; and all others, 9%).

[29] $33^2 + 31^2 + 16^2 + 11^2 = 2427$

[30] *See* U.S. Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines* (Aug. 19, 2010), at § 5.3.

[31] *See* Kevin J. O'Brien, *Europe's Consumers Could Lose in Auctions of Internet* (continued . . .)

Perhaps more importantly, greater spectrum resources in the hands of these four companies will expand exponentially the "gatekeeping" market power of these entities. Putting aside the challenged legality of the Commission's newly adopted network neutrality principles, one must seriously question whether any regulatory structure can safeguard a citizenry whose principal means of interconnectivity may soon be controlled by only four corporate entities. The world recently witnessed the ability of the Mubarak regime to totally shut down Internet connectivity throughout Egypt because control of the telecommunications system was essentially vested in two entities. The even greater aggregation of control that will accrue to large entities purchasing even larger blocks of spectrum is fundamentally inconsistent with democratic principles. At the same time, it is ironic, if not schizophrenic, to contemplate the sale of 120 MHz of spectrum in a market to one wireless broadband provider (and likely to that same provider in multiple markets on a regional basis) to implement a national broadband policy[32] while restricting ownership of multiple television stations in the same market. Indeed, the *Notice* even moves in the opposition direction, proposing a bandwidth allocation framework for "channel sharing" in which a television station would ultimately have access to something less than its existing 6 MHz of spectrum.

(. . . continued)
Spectrum, NEW YORK TIMES (Mar. 13, 2011), *available at* <http://www.nytimes.com/2011/03/14/technology/14spectrum.html?_r=1&ref=technology> (reporting that the "sale and redeployment of lucrative television broadcast frequencies . . . has done little to increase competition, instead reinforcing the position of existing market leaders . . . because the largest operators are using their superior financial and political clout to shut newcomers out of the bidding process and out of the mobile market").

[32] It should be of concern to the government that there are no spectrum ownership limits. As a matter of national security, there should be multiple providers to ensure redundancy, and from a financial perspective, no one or two wireless companies should be "too big to fail" when dealing with such critical communications infrastructure.

And the *Plan* goes further, proposing a "repacking" of the television spectrum in which wireless companies will be permitted to operate with the most desirable "beach front" spectrum while broadcasters will be relegated to the less desirable "landfill" spectrum of the VHF frequencies which are filled with man-made noise—the detritus of the airwaves. The Commission has already obtained substantial evidence that its attempts in the *Notice* to rehabilitate the VHF spectrum, particularly the low VHF band, cannot succeed as a scientific and engineering matter.[33]

Even if the VHF band could be made attractive, the fact remains that the *Plan*'s aspirational goal cannot be achieved without a broadcast component. The Commission simply should allow market forces to drive the convergent evolution of a broadcast and wireless broadband technology, rather than allocating television broadcast spectrum to an industry with no broadcasting experience to develop a broadcasting component to wireless broadband delivery mechanisms.

V. Television Broadcasting Is the Solution to Any Potential Spectrum Crisis Driven by Mobile Video Demand

Digital television broadcasting, as currently constituted, utilizes modulation and compression techniques developed during the dawn of the digital era. The *Plan* and now the *Notice* largely appear to approach television broadcasting technology as immutable and do not appear to contemplate a flexible broadcast architecture for the future. The *Plan* and *Notice* fail to address the capacity for broadcast industry innovation, and they fail to envision a path of

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[33] *See* FCC, Office of Engineering and Technology, Broadcast Engineering Forum, *VHF Reception Panel Powerpoint* (June 25, 2010), *available at* <http://reboot.fcc.gov/workshops/broadcast-engineering-forum>.

convergent evolution of a broadcast and wireless broadband technology, i.e., "broadband broadcasting."[34] But just as "spectral efficiency of wireless technologies has increased by a factor of roughly 40 or more since the early days of second-generation (2G) wireless,"[35] so, too, have modulation and compression schemes made tremendous advances since the fixation of 8-VSB and MPEG2 as ATSC standards adopted by the Commission. There is no law of physics, law of economics, or even law of Congress that says television broadcasting must forever use late 20th century technology.

To the contrary, television broadcasting is continuously innovating. The industry quickly adopted mobile DTV standards (ATSC-M/H), and already dozens of stations, including Capitol's, are broadcasting their station's signals to mobile devices. As discussed below, mobile DTV has enormous capability to accommodate a substantial portion of mobile video demand requirements. Yet, even today, broadcasters are laying the groundwork for new modulation, compression, and transmission schemes, the next phase of broadcast technology evolution,

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[34] The *Plan* does state:

> [E]merging broadcast applications, such as mobile DTV and data casting, may provide an opportunity to take advantage of the relative efficiencies of point-to-multipoint and point-to-point architectures in order to deliver various types of content in the most spectrum-efficient ways. . . .
>
> . . . In particular, broadcasting popular video content to mobile devices may help offload growing video streaming traffic from mobile point-to-point broadband networks.

Plan at 89, 91. Thus the *Plan* seemed to acknowledge the evolutionary possibilities of television broadcasting, but it failed to explore their potential. Indeed, the *Plan*, just two sentences later, flatly declares, "The business model for mobile DTV is uncertain . . . ," *Plan* at 91, as if uncertainty could not be brimming with opportunity.

[35] *Plan* at 41.

techniques that show great promise and which will serve to mitigate, if not avert altogether, any future spectrum scarcity or bandwidth crisis.

As noted above, mobile DTV already offers a valuable mechanism to deliver video to mobile and handheld devices in a spectrally efficient manner. Wireless carriers and broadcasters can work together *now* to leverage the benefits of existing broadcast technologies to deliver video content in connection with wireless broadband services. Just as wireless carriers already seek to offload as much content to Wi-Fi networks as feasible (and are exploring greater offloading opportunities to femtocells), so, too, can high demand video content be offloaded to broadcasters. It is hardly rational to promote millions of *point-to-point* two-way unicast sessions for wireless carriers when the most popular content—primarily broadcast television content—can be more efficiently delivered to mobile devices by *point-to-multipoint* television broadcasting.

Such offloading can have multiple components. The most popular content, by far, is broadcast television content. That content is already being (or could be) broadcast virtually everywhere and can be (or could be) received by appropriately equipped handsets. In the case of live programming, therefore, there is no reason for the video content to be streamed over unicast sessions since it is already available via broadcast means. There is simply no reason for popular live programming—*March Madness*, say,[36] or the local news, or breaking public safety or emergency information—to congest wireless networks.

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[36] CBS and Turner are streaming March Madness to iPhones and iPads for free this year. *See, e.g.*, Caleb Johnson, Switched.com, *March Madness On Demand to Bring Free Live Games to iPad, iPhone* (Mar. 3, 2011), *available at* <http://www.switched.com/2011/03/03/march-madness-on-demand-free-to-ipad-iphone/>. In 2010, fans watched more than 11.7 million hours of the tournament online.

On-demand viewing of popular broadcast television content need be treated little differently. Mobile and other handheld devices, such as smartphones and tablets, are essentially small portable computers. They have (cheap) memory capability and can easily be utilized as portable DVRs. Popular broadcast television programming—*CSI* and sports, for example—can be "pushed" to mobile devices as they are broadcast by television stations and recorded in the DVR/memory of the mobile receiving device for later playback. When the user attempts to view the programming in a unicast session, the device can seamlessly play back the content already stored without utilizing wireless broadband bandwidth.

This "push" technique can also work for the most popular non-broadcast television video content as well. It would be straightforward for a television station to embed the 50 most popular YouTube videos in its broadcast transmission and push those videos to mobile devices. When a user attempts to view one of the videos, the device, again, seamlessly plays back the content.

To achieve seamless offloading, ATSC-M/H, the mobile DTV standard, can utilize multiple return paths, including 3G/4G cellular, Wi-Fi, and WiMax, as well as wired Internet connections. Cooperation between wireless carriers and broadcasters is necessary, but the technology already exists to significantly reduce wireless network congestion. Between live broadcast television programming, the most popular on-demand broadcast television programming, and the most popular non-broadcast television programming, a substantial portion of mobile video traffic can be offloaded from wireless networks to television broadcasting.[37]

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[37] According to one source, less than 10% of content represents more than 70% of all over-the-top consumption. *See* CMMB America, *The Broadcast Advantage*, *available at* <http://cmmbamerica.com/the-broadcast-advantage>.

The real key to spectrum efficiency is not offloading under the existing ATSC 8-VSB scheme, but what amounts to a new type of innovative broadband broadcasting. This will require an evolution of broadcasting technology to a new modulation, coding, and transmission scheme, of which various varieties are currently being developed around the world. One possibility is that a new broadcasting standard could be based on Orthogonal Frequency Division Multiplexing ("OFDM") (rather than 8-VSB), which is the same system used by LTE.[38] Examples of the advantages of a future OFDM broadcasting system over the current 8-VSB ATSC standard include:

* Elimination of adjacent channel interference issues
* Less susceptibility to multipath interference
* Use of Multiple Input Multiple Output (MIMO) transmission which minimizes the impact of frequency selective fading
* Capable of 30-40 Mbps throughput (rather than 19.4 Mbps)
* Capable of a Single Frequency Network (SFN) layout for wireless broadband offloading
* Integrated chipsets for both fixed and mobile devices
* Standards will be software upgradeable, like LTE, so the technology will not become obsolete

[38] A technical schema of what one version of this new broadcasting standard could look like has already been filed with the Commission in this docket. *See Ex Parte* Submission of Sinclair Broadcast Group, ET Docket No. 10-235 (filed Jan. 27, 2011). This schema has been reviewed favorably by at least one independent engineer. *See* Doug Lung, *Is LTE in Broadcast's Future?*, TVTECHNOLOGY (Mar. 1, 2011), *available at* <http://www.tvtechnology.com/article/114486> (noting several advantages of OFDM and that "17 stations would be able to fit in the same spectrum (including guard bands) where 14 stations are now" and further commenting that "it seems clear that TV broadcasting has to be given the regulatory opportunity to modify its transmission technology to keep up with other industries if broadcasting is going to survive").

Under this new broadcasting standard, television broadcasters would partner with wireless carriers to seamlessly deliver mobile video content in the most efficient manner possible. Such broadcast evolution will enable collaborative systems that can shift content "on the fly" between broadcast and wireless broadband/unicast delivery. The result would be the ability for consumers to experience the type of anytime, anywhere service the *Plan* contemplates—without a spectrum crisis and without the *Plan*'s accompanying adverse environmental and other public policy consequences.

This convergent evolution is currently under consideration in Europe. France Telecom, a mobile operator, has proposed a "full convergence between 3GPP [3rd Generation Partnership Project] and DVB [Digital Video Broadcasting] mobile broadcasting standards (including low layers), in order to define a single system able to be operated in both 3G and UHF bands."[39] France Telecom further states that "Broadcasters on one hand, and Telecommunication operators on the other, are considering that broadcast and Telco cooperation can be an opportunity rather than a threat. This confluence could benefit . . . these two key players . . . ."[40] France Telecom then proceeds to describe the technology underlying the convergence of mobile broadcasting solutions. There is no particular reason why such convergence and cooperation cannot work in the United States, and the Commission would be unwise—indeed, irresponsible—to ignore its potential.

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[39] France Telecom, *Response to DVB-NGH Call for Technologies, 3GPP LTE Broadcast Mode (E-MBMS) Embedded in DVB-T2 Future Extension Frame* (Sept. 3, 2010), at 6.

[40] *Id*. at 8.

VI. The Commission Should Initiate a Rulemaking Proceeding to Focus on a Broadband Broadcasting Convergence That Can Satisfy the Wireless Broadband Aspirations of the National Broadband Plan

Broadcasting is the *original* wireless broadband. And television broadcasting is part of the solution for the wireless broadband connectivity envisioned by the *Plan*. But television broadcasting must be not only permitted but encouraged to evolve to meet the communications needs of Americans throughout the 21st century. This requires bold action, but nothing less can satisfy the demands projected to be placed on spectrum resources.

To initiate this action, Capitol respectfully requests that the Commission commence a rulemaking proceeding to consider these issues, and Capitol proposes the following timeline, which is intended to still enable the Commission to meet the *Plan*'s 10-year target to repurpose 500 MHz of spectrum for wireless broadband services:

Year 1	•	Conduct comprehensive spectrum inventory analysis
	•	Launch rulemaking proceedings
	•	Launch cross-industry working group focused on (1) identifying immediate opportunities to offload wireless broadband bandwidth overload to broadcasters utilizing the current mobile DTV technology and (2) developing a television broadcasting/wireless broadband convergent evolution technology path
	•	Encourage and permit "proof of concept" or alpha testing of offloading, including, as feasible, developmental licenses for new modulation, coding, transmission, and compression techniques
Years 2-4	•	Develop standards for new television broadcasting modulation, coding, transmission, and compression schemes, possibly utilizing OFDM
	•	Encourage and permit beta testing with developmental or experimental licenses

- Hold auction on 380 MHz of non-broadcast television spectrum, thereby satisfying the Plan's timeline for 330 MHz

Years 5-7
- Complete broadband broadcasting rollout with new standards

Years 8-10
- If proven to be necessary and feasible, repack television broadcast stations to the extent consistent with the new standards
- Hold auction on reclaimed broadcast television spectrum to be used for wireless broadband services after broadband broadcasting rollout is completed

The benefits of proceeding to a broadband broadcasting convergence are numerous:

* It creates a means to solve the perceived spectrum problem in a long-term fashion.

* It will deliver the maximum efficiency out of the broadcast television spectrum bands.

* It creates a complementary broadband/broadcasting architecture, rather than wireless broadband duplicating broadcasting capability.

* It addresses the mobile video demand curve as the primary driver of the perceived spectrum crisis and utilizes the most established and efficient technology—broadcasting—to solve the problem.

* It will lower the capital costs of wireless broadband providers, which can both spur competition by lowering the costs of entry and ultimately benefit consumers with lower prices.

* It provides an opportunity for a full spectrum inventory audit to be completed and recently purchased spectrum to be deployed so that a true market value for any auctioned spectrum can be realized, and it provides an opportunity for international

harmonization that, if successful, will also increase the value of any auctioned spectrum.

* It creates innovation opportunities for local television broadcasters, and, to the extent stations partner with wireless broadband providers, it can provide an ongoing revenue stream to the government through the current 5% ancillary/supplementary services fee.

* It recognizes broadcasting as integral to the 21st century communications ecosystem rather than marginalizing it as an outmoded 20th century technology.

* It can achieve all these goals and still meet the *Plan*'s 10-year target to repurpose 500 MHz of spectrum for wireless broadband services.

In contrast, if government policy fails to promote cooperation between broadcasters and wireless carriers, then the nation will likely see further calls for additional spectrum reallocations and auctions within the next 10-15 years, if not sooner.

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The instant proceeding represents the Commission's first attempt to implement those aspects of the *Plan* affecting television broadcast spectrum and television service. But it is also the first attempt for the Commission to consider alternatives to the recommendations set forth in the *Plan*. Capitol urges the Commission to do so. Proceeding now to reallocate television broadcast spectrum to fixed and mobile wireless services would be premature and inappropriate. The highest and best use of broadcast spectrum to solve any potential wireless broadband spectrum crisis is for it to retain its current allocation structure. If the best means to address mobile video demands must rely on broadcasting capability, then it follows that as much spectrum as possible should remain allocated to broadcasting. As demonstrated herein, the Commission's staff's *Plan* as proposed will never be able to achieve its ultimate goal of providing mobile video to anyone, anytime, anywhere. If the Commission continues to proceed

down the path proposed in the *Notice*, broadcasting will be hamstrung and it will be difficult, if not impossible, to capitalize to the fullest extent possible on the opportunities presented by the innovations in television broadcasting technologies that are on the horizon.

Conclusion

For the foregoing reasons, Capitol respectfully requests that the Commission not adopt the various proposals contained in the *Notice* and proceed, instead, to commence rulemaking proceedings focused on initiating a broadband broadcasting convergence to meet the communications needs of 21st century America. Capitol looks forward to working cooperatively with the Commission, Congress, and the wireless industry to that end.

Respectfully submitted,

/s/

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